



Sensory Evaluation of Banana Bread Made With Different Fat Substitutes

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Abstract

Background: Heart disease due to atherosclerosis is one of the most common causes of death in America. Atherosclerosis is caused by the high consumption of saturated and trans fats in the diet. One of the most common sources of this fats is sweetened breads.

Objective: To evaluate the acceptability in texture and flavor of banana bread cooked with different fat substitutes in comparison to a regular loaf made with butter.

Design: Four different loaves of banana bread were cooked. A control made with the normal source of fat in a banana bread recipe, butter and the three different variables consisting of applesauce, canola oil, and avocados. After the four different loaves were made, a piece of each loaf was presented to 24 participants selected at random in Jones Science Center. Each sample was evaluated for flavor, aftertaste, moisture, texture, interior, and crust color using a scorecard.

Results: After the results were collected for all the samples, the canola oil variable rated the best in the flavor, aftertaste, and interior color category, both the avocado and canola oil variable shared a similar rating in the crust color category, and the avocado and applesauce variable shared a similar rating in the texture and moisture category.

Conclusion: A banana bread with a similar acceptability rate to that of the control can be created with a lower fat content.

Purpose Statement

The purpose of this experiment was to observe the differences in crust and interior color, flavor, aftertaste, texture, and moisture of banana bread baked with different fat substitutes that would decrease the overall fat content of the loaf.

Significance of the Study

High fat diets have been researched to increase overall caloric intake leading to a higher percentage of weight gain in the general population.¹ With the increasing obesity epidemic in the United States, a transition to lower fat diets that can reduce overall caloric intake is of great significance. It has been demonstrated that the increase in availability of highly palatable, and calorically dense foods is one of the main contributors to the obesity epidemic.^{2,3} In addition to increasing the overall caloric intake in the diet, high fat diets contribute to high levels of LDL cholesterol which can contribute to a higher risk of cardiovascular disease. This study's significance relies on the modification of a high fat recipe of banana bread containing butter with three substitutes that are lower in fat and cholesterol: canola oil, avocados, and applesauce. If a high receptivity based on taste, texture, consistency, and presentation of the recipe with any of the modified ingredient is seen, it can be concluded that the consumption of a highly palatable dessert such as banana bread can be presented without the health consequences of a high fat and cholesterol recipe.

Methodology

A score card with different descriptions of the taste evaluation of banana bread was created substituting numbers for each of the variables that were modified in the banana bread (Figure 1).

The control was labeled #22, the sample substituted with avocados was labeled #18, the sample substituted with applesauce #20, and the sample made with canola oil #24. Each characteristic was given a number (1,3 or 5) that described the consistency experienced by the participant.

After creating the scorecard, the four different samples were created keeping all ingredients, cooking time, and temperature equal across all variables to evaluate them objectively against the control. Since the variable to be manipulated in this experiment was total fat content, the butter was substituted with either ¾ cup canola oil, ½ cup of applesauce, and 1 cup pureed avocado (Table 1).

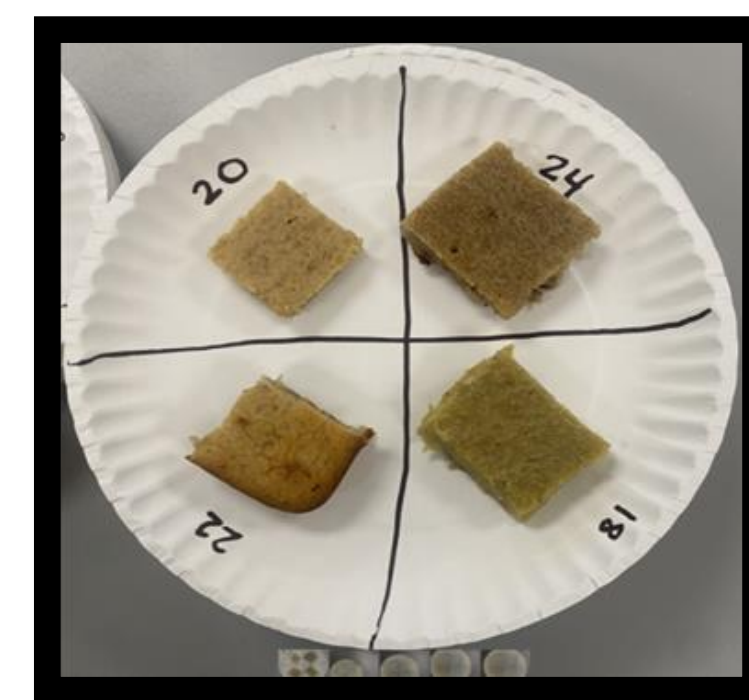


Figure 1. Variable Presentation

Ingredient	Butter	Applesauce	Avocados	Canola Oil
Bananas	6 whole	6 whole	6 whole	6 whole
Eggs	2 Large	2 Large	2 Large	2 Large
Sugar	1 cup	1 cup	1 cup	1 cup
Whole milk	1 cup	1 cup	1 cup	1 cup
Vanilla extract	1 tsp	1 tsp	1 tsp	1 tsp
Fat	1 cup	½ cup	1 cup pureed	¾ cup
Flour	1 cup	1 cup	1 cup	1 cup

All four breads were cooked for 45 minutes or until a clear toothpick was inserted in the middle of the bread was obtained. After the three different variables and the control were baked. Twenty-five participants were asked to evaluate the different samples of banana bread evaluating them from one to five for the characteristics described in the score card (Figure 2). The samples were presented to the participants in a plate with the control and the three different variables labelled according to the number given in the scorecard. After the results were obtained. All the results were inputted into Excel for data analysis.

Characteristic	Banana Bread Sample			
	18	20	22	24
Interior Color 1=white 3=creamy 5=yellow				
Crust Color 1=very pale 3=pleasing golden brown 5=very brown, burned				
Flavor 1=not nearly sweet enough 3=Pleasingly sweet 5=much too sweet				
Aftertaste 1=none 3=Slight aftertaste 5=Strong aftertaste				
Texture 1=Too creamy 3=Pleasantly creamy 5=Very tough				
Moisture 1=Mushy 3=Pleasantly moist 5=too dry				

Figure 2. Scorecard Evaluation of Banana Bread

Results

Overall Interior Color

The canola oil variable was labeled as the creamiest with an average score of 2.7

Overall Texture

Canola oil was labeled as the most pleasantly moist with an average score of 2.8

Overall Moisture

Of all the sample, the control was described as the most pleasantly moist with a score of 2.6

Overall Aftertaste

All the samples were categorized as having a slight aftertaste with the control having a score of 2.7, canola oil a score of 3, applesauce a score of 3, and avocados a score of 3.1 in a scale where 1=none, 3=slight aftertaste, and 5=strong aftertaste.

Overall Crust Color

Of all the sample, the applesauce and avocado sample were labeled as the most pleasingly golden brown with a score of 2.8.

Overall Flavor

Of all the samples, the applesauce and avocado sample were labeled as the most pleasingly sweet with a score of 2.8 (Figure 3).

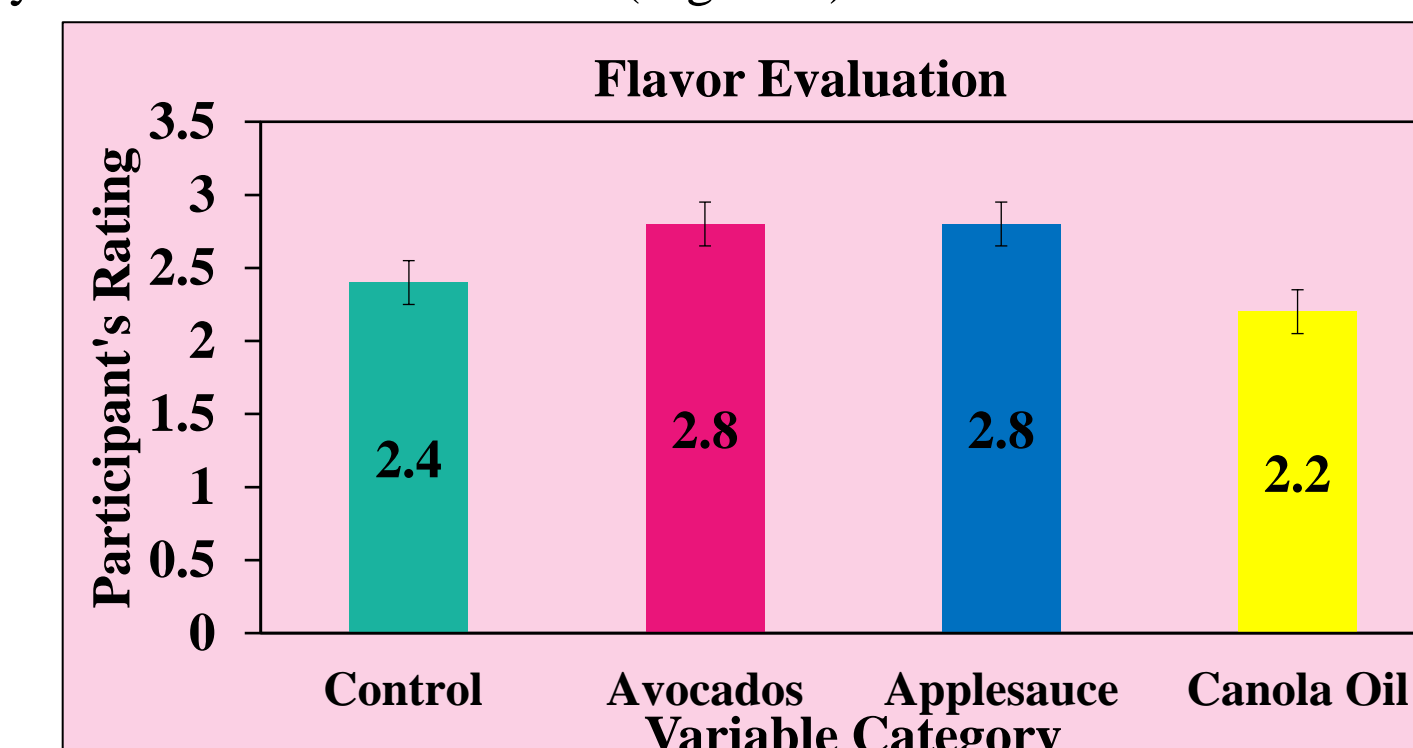


Figure 3. Flavor Evaluation Results

Canola Oil

The canola oil sample was described as having a slight aftertaste by 39% of participants, a pleasingly sweet flavor by 50% of participants, a crust color of golden brown by 58% of participants, a creamy interior color by 54% of participants, a moisture of pleasantly moist by 46% of participants, and a texture of pleasantly creamy by 58% of participants.

Control

The butter control was labeled as having an interior color of creamy by 54% of participants, a texture of pleasantly creamy by 71% of participants, a flavor of pleasingly sweet by 67% of participants, a crust color of golden brown by 42% and golden brown by burned by 38% of participants, a moisture of pleasantly moist by 63% of participants, and as having a slight aftertaste by 42% participants.

Applesauce

The moisture of the applesauce sample was categorized as pleasantly moist by 50% participants, a pleasingly sweet texture by 50% of participants, a crust color of very pale by 50% participants, and interior color of creamy by 46% of participants, a flavor of pleasingly sweet by 63% of participants, and as having a slight aftertaste by 46% of participants.

Avocados

The flavor of the avocado sample was labeled pleasingly sweet by 50% of participants. The crust color was labeled as very pale by 42% of participants and golden brown by another 42% of participants. The texture was labeled as too creamy by 43% of participants and as pleasantly creamy by 39% of participants. The sample was described as having a slight aftertaste by 46% of participants, an interior color of yellow by 46% of participants, and a moisture of too mushy by 71% of participants (Figure 4)

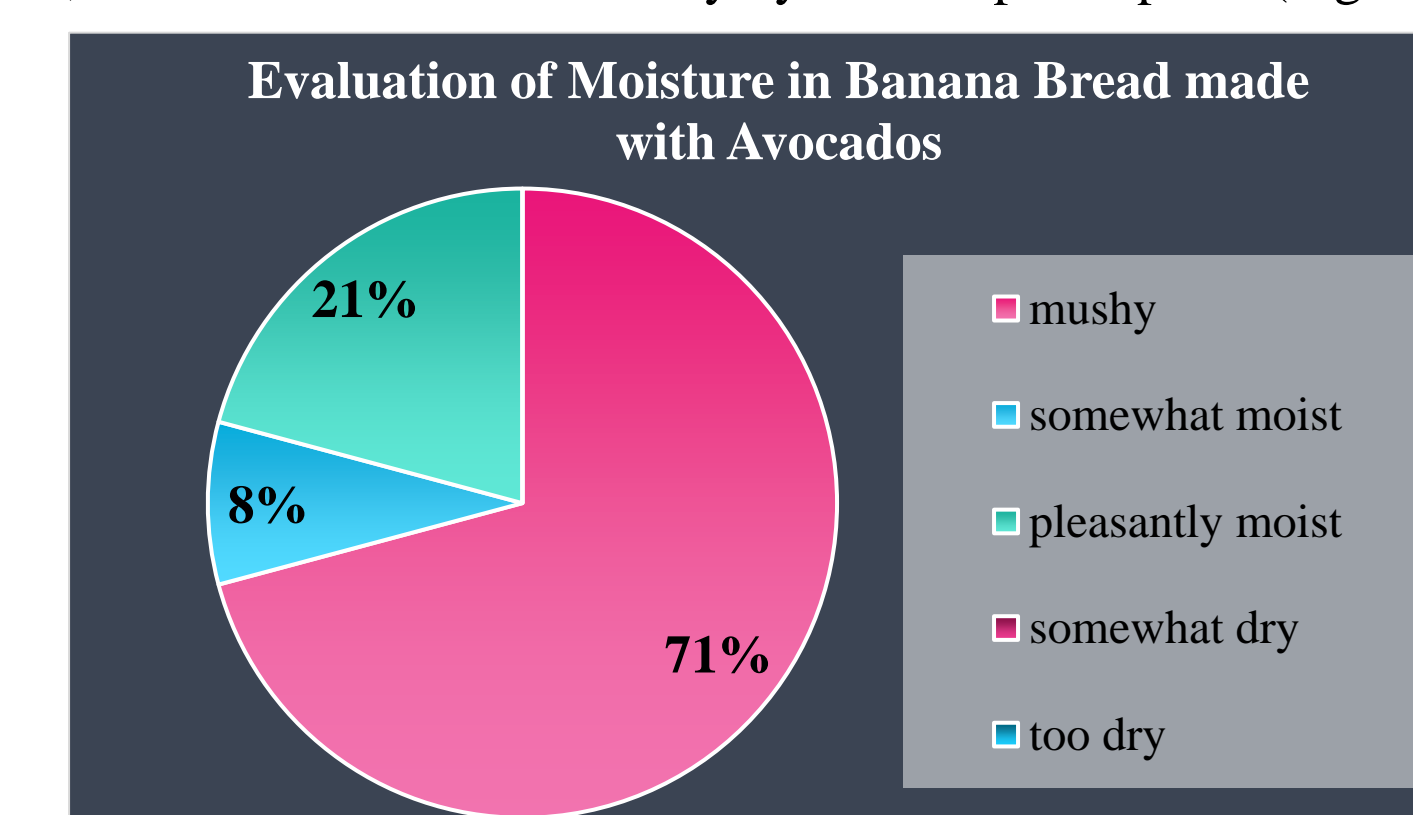


Figure 4. Moisture Evaluation Results for Avocado Variable

Results

Nutrition analysis was conducted through Nutritionist Pro and of all the samples evaluated, the applesauce variable had the lowest overall fat content followed by the avocado sample and finally the canola oil sample. (Figure 5 and Table 2).

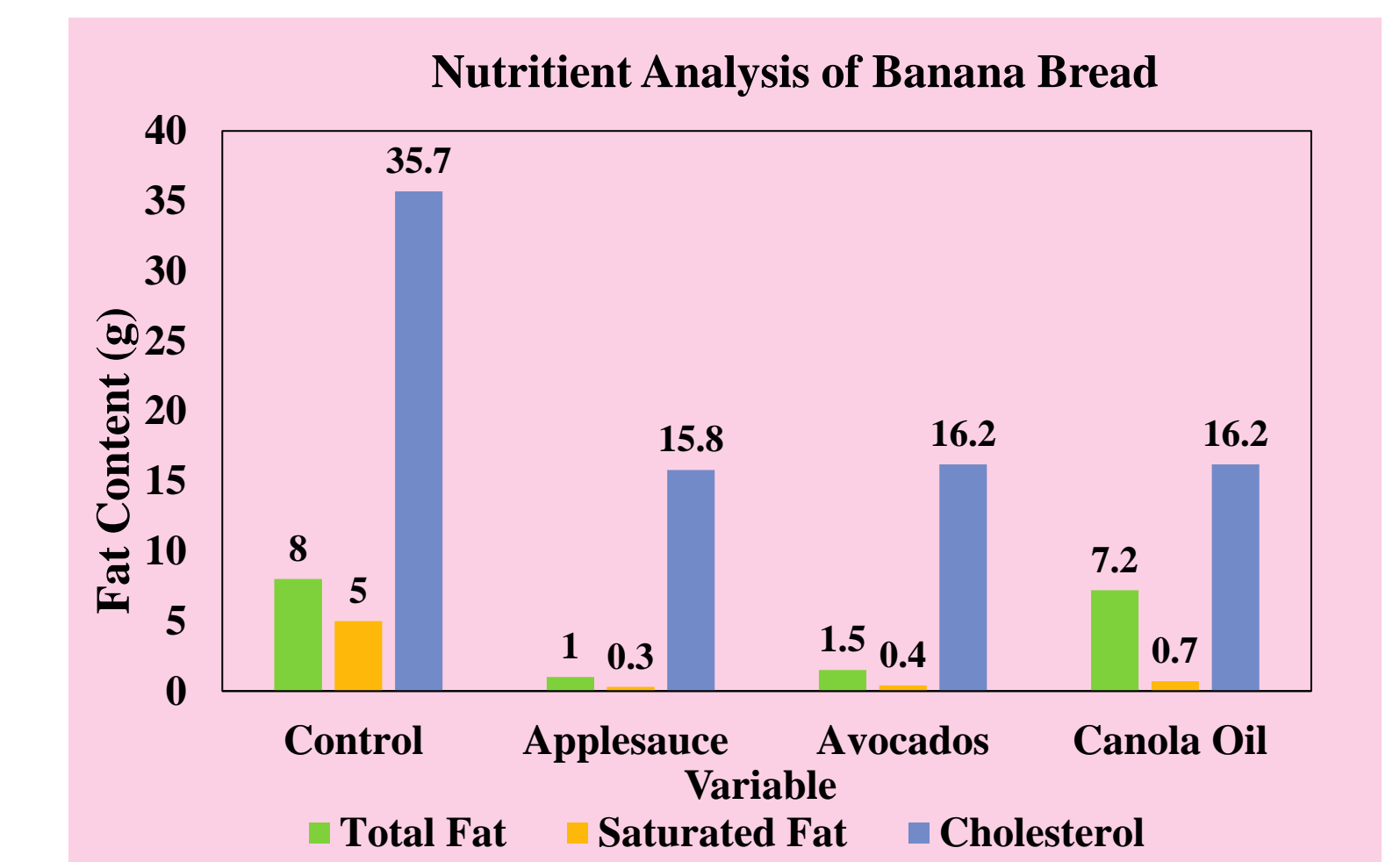


Figure 5. Fat Nutrition Analysis across all variables

Table 2. Nutrition Analysis of All Samples

Variable	Calories (kcal)	Total Fat (g)	Saturated Fat (g)	Monosaturated Fat (g)	Polysaturated Fat (g)	Cholesterol (mg)
Control	153	8g	5 g	2.2 g	0.3 g	35.7 mg
Applesauce	104	1g	0.3 g	0.2 g	0.1 g	15.8 mg
Avocados	98	1.5 g	0.4 g	0.7 g	0.13 g	16.2 mg
Canola Oil	145	7.2 g	0.7 g	4.2 g	1.9 g	16.2 mg

Conclusion

Of all the recipes, the canola oil variable rated the best in the aftertaste, and interior color category, both the avocado and canola oil variable shared a similar rating in the crust color category, and the avocado and applesauce variable shared a similar rating in the texture, flavor, and moisture category. Compared to the ratings collected from the control, the sensory evaluation of the three different variables were shown to have a very similar rating. Nutritionally speaking, compared to the control all the variables had a lower content of saturated fat, therefore being more beneficial towards preventing cardiovascular disease. These results led to the conclusion that a banana bread loaf with a similar flavor, aftertaste, and interior color to that made with butter but with a lower saturated fat content can be made by using canola oil as the fat substitute.

References

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